



TITLE OF THE INVENTION

Manufacturing Process for a Plastic Injection Molding Laminated with Textile Fabric, Non-
Woven or the Like

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BACKGROUND OF THE INVENTION

[0001] The invention relates to a manufacturing process for a plastic injection molding laminated with a textile fabric, a non-woven or the like, and a textile fabric, a non-woven or the like for laminating and permanent joining to a piece of plastic interior trim of any shape, particularly for the automotive sector.

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[0002] Polyester or blended fabrics are preferably used as the textile fabrics and permanently applied to the injection molding as cladding. These materials are usually textile fabrics laminated with a non-woven. It is known from the prior art that these laminated textile fabrics are initially cut to size and the blank then placed inside the injection mold. In order to obtain a wrinkle-free surface, the fabric must be tension-mounted inside the injection mold.

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This is preferably achieved using a pneumatically actuated clamp system. After tension-mounting the fabric - a relatively time-consuming process - a backing is then injection molded onto it. After the injection process ends, the semi-finished workpiece, such as a column trim panel for the passenger car sector, is ejected and conveyed to the trimming station. In the trimming station, the fabric protruding over the edge of the workpiece must be trimmed in order to obtain the finished workpiece.

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[0003] The workpieces are generally of three-dimensional geometry, meaning that the edge contour is also three-dimensional. According to the prior art, trimming requires an article-specific trimming cell, which can process the respective edge contour of the workpiece. The throughput time of an individual workpiece is decisively dependent on the operating speed of the injection molding machine, as this is usually the bottleneck in the manufacturing process.

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[0004] The invention is based on the technical problem of further developing a generic manufacturing process such that the throughput times are reduced.

BRIEF SUMMARY OF THE INVENTION

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[0005] According to the invention, the object is solved in that the manufacturing process comprises the following steps:

- Preforming of a fabric blank, which is coated on a first side facing the injection molding with a plastic film that is thermoformable and, when cooled, dimensionally stable and elastic, into the desired outer contour of the injection molding to be manufactured.

- Insertion of the preformed fabric blank into the injection mold,
- 5 - Injection-backing of the fabric blank with plastic, and
- Ejection of the laminated injection molding.

[0006] Prior to the start of the actual injection molding process, the fabric blanks are consequently already given the prefabricated contour they need to cover the finished injection molding. In contrast to the prior art, a first side of the fabric on the inside of the finished
10 product is provided with a thermoformable plastic. In the first process step, the fabric blank is thermoformed in a corresponding mold, in order to obtain the desired outer contour of the later injection molding. This plastic is dimensionally stable after cooling. At the same time, however, it is still so elastic that a bend can be formed with the fabric on the workpiece.

[0007] Contour trimming can be carried out after the preformed textile blanks cool.
15 This can be done by an automatic machine, such as an articulated robot. This makes it possible to realize the three-dimensional contour trimming of the edge profile that is particularly common on interior trim in the automotive sector and cannot be realized with the simple thermoforming process step alone; in the case of thermoforming, trimming can only achieve a two-dimensional edge cut.

20 [0008] After contour trimming, the preformed fabric is inserted into the injection mold. The plastic film is impermeable to air, meaning that the fabric can also be handled from the fabric side by the suction grippers usually used in injection molds, in order to be inserted into the injection mold or removed from it. Thus, the usual automatic machines or robots can be used for handling in the process according to the invention without refitting.

25 [0009] The preformed fabric is injection-backed with plastic in the injection mold in the familiar manner. During injection molding, the injected plastic is permanently joined to the plastic film already provided on the fabric.

[0010] After injection molding, the laminated workpiece is removed from the injection mold and ejected. Accordingly, no further trimming of the workpiece is required. This initially
30 makes continuous manufacturing possible, as the process is no longer dependent on the cycle times of the injection mold. In addition, article-specific trimming cells are unnecessary, this substantially reducing the space required for the manufacturing process. Furthermore, the

fabric blanks are easy to handle, thus making it possible to realize far higher capacity utilization.

[0011] The preformed fabric blank is preferably first cut to fit the outer contour of the finished workpiece. This can be carried out by a trimming robot, for example. The article-specific trimming cells of the prior art thus become obsolete. The trimming robots can carry out any required trimming.

[0012] According to the invention, the plastic film is made of materials that can be joined particularly well with the plastic to be injected later on. Thermoplastic olefins, variants thereof, or thermoplastic urethanes are preferred for use.

[0013] Alternatively, the surface of the film facing the fabric can also be coated with an activator that permanently joins the fabric to the injected plastic and also simplifies and accelerates the joining process.

[0014] The thickness of the laminated fabric is usually about 5 mm and that of the plastic film about 2 mm. Depending on the application, the latter dimensions can also be thicker if complicated contours have to be reproduced.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0015] The foregoing summary, as well as the following detailed description of the invention, will be better understood when read in conjunction with the appended drawings. For the purpose of illustrating the invention, there is shown in the drawings an embodiment which is presently preferred. It should be understood, however, that the invention is not limited to the precise arrangements and instrumentalities shown.

[0016] In the drawings:

[0017] Fig. 1 is a schematic top view of the manufacturing process according to the invention; and

[0018] Fig. 2 is a lateral cross-section of the textile fabric according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0019] Figure 1 shows a top view of the manufacturing process according to the invention. According to the drawing, the process essentially consists of two elements, namely thermoforming station 1 and injection molding station 2.

[0020] According to the process of the invention, laminated fabric 3, which is delivered in prefabricated form and provided with the plastic film on one side, is delivered in rolls and unrolled on thermoforming station 1. A thermoforming device, which is preferably designed as automatic thermoforming machine 4, preforms the fabric into preformed fabric blanks 5.

5 [0021] Trimming robots 6 and 7 cut fabric blanks 5 to the final outer contour they will have on the finished workpiece. In this case, trimming robots 6 and 7 are designed as articulated robots.

[0022] The preformed and trimmed preforms are then conveyed to an intermediate buffer 8. The individual fabric blanks 5 are conveyed from this intermediate buffer 8 by another
10 automatic machine, which is preferably designed as a linear robot 9 due to the required precision, to the actual injection molding process in injection molding machine 10. After injection molding, the laminated workpieces are ejected from injection mold 10 by articulated robot 9 and forwarded to assembly.

[0023] Figure 2 shows a lateral view of a fabric blank 5 shortly after thermoforming.
15 Thermoforming is carried out in an automatic thermoforming machine 4, which consists in the known fashion of a bottom force 4a and a top force 4b. Heat is applied to the top force and, when bottom force 4a and top force 4b are pressed together, it thermoforms plastic film 5a provided on fabric blank 5.

[0024] Plastic film 5a lies on the bottom force. Vacuum ducts 4c are also provided on
20 bottom force 4a. Fabric blank 5 consists of a plastic film 5a lying on bottom force 4a, the underside of which is joined to a textile fabric 5b laminated with a non-woven.

[0025] After preforming, fabric blank 5 has a three-dimensional, shell-type shape. The flange-like edge 5c around the outside can either be removed during contour trimming or folded in towards the inside of the finished workpiece, if a workpiece with a fold is to be
25 manufactured.

[0026] It will be appreciated by those skilled in the art that changes could be made to the embodiments described above without departing from the broad inventive concept thereof. It is understood, therefore, that this invention is not limited to the particular embodiments disclosed, but it is intended to cover modifications within the spirit and scope of the present
30 invention as defined by the appended claims.



List of reference numbers

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|----|----|---------------------------------|
| | 1 | Thermoforming station |
| | 2 | Injection molding station |
| 5 | 3 | Textile fabric |
| | 4 | Automatic thermoforming machine |
| | 4a | Bottom force |
| | 4b | Top force |
| | 4c | Vacuum ducts |
| 10 | 5 | Fabric blank |
| | 5a | Plastic film |
| | 5b | Textile fabric |
| | 5c | Edge |
| | 6 | Trimming robot |
| 15 | 7 | Trimming robot |
| | 8 | Intermediate buffer |
| | 9 | Articulated robot |
| | 10 | Injection mold |

<p> 1971-1972 1973-1974 1975-1976 1977-1978 1979-1980 1981-1982 1983-1984 1985-1986 1987-1988 1989-1990 1991-1992 1993-1994 1995-1996 1997-1998 1999-2000 2001-2002 2003-2004 2005-2006 2007-2008 2009-2010 2011-2012 2013-2014 2015-2016 2017-2018 2019-2020 2021-2022 2023-2024 2025-2026 2027-2028 2029-2030 2031-2032 2033-2034 2035-2036 2037-2038 2039-2040 2041-2042 2043-2044 2045-2046 2047-2048 2049-2050 2051-2052 2053-2054 2055-2056 2057-2058 2059-2060 2061-2062 2063-2064 2065-2066 2067-2068 2069-2070 2071-2072 2073-2074 2075-2076 2077-2078 2079-2080 2081-2082 2083-2084 2085-2086 2087-2088 2089-2090 2091-2092 2093-2094 2095-2096 2097-2098 2099-2100 2101-2102 2103-2104 2105-2106 2107-2108 2109-2110 2111-2112 2113-2114 2115-2116 2117-2118 2119-2120 2121-2122 2123-2124 2125-2126 2127-2128 2129-2130 2131-2132 2133-2134 2135-2136 2137-2138 2139-2140 2141-2142 2143-2144 2145-2146 2147-2148 2149-2150 2151-2152 2153-2154 2155-2156 2157-2158 2159-2160 2161-2162 2163-2164 2165-2166 2167-2168 2169-2170 2171-2172 2173-2174 2175-2176 2177-2178 2179-2180 2181-2182 2183-2184 2185-2186 2187-2188 2189-2190 2191-2192 2193-2194 2195-2196 2197-2198 2199-2200 2201-2202 2203-2204 2205-2206 2207-2208 2209-2210 2211-2212 2213-2214 2215-2216 2217-2218 2219-2220 2221-2222 2223-2224 2225-2226 2227-2228 2229-2230 2231-2232 2233-2234 2235-2236 2237-2238 2239-2240 2241-2242 2243-2244 2245-2246 2247-2248 2249-2250 2251-2252 2253-2254 2255-2256 2257-2258 2259-2260 2261-2262 2263-2264 2265-2266 2267-2268 2269-2270 2271-2272 2273-2274 2275-2276 2277-2278 2279-2280 2281-2282 2283-2284 2285-2286 2287-2288 2289-2290 2291-2292 2293-2294 2295-2296 2297-2298 2299-2300 2301-2302 2303-2304 2305-2306 2307-2308 2309-2310 2311-2312 2313-2314 2315-2316 2317-2318 2319-2320 2321-2322 2323-2324 2325-2326 2327-2328 2329-2330 2331-2332 2333-2334 2335-2336 2337-2338 2339-2340 2341-2342 2343-2344 2345-2346 2347-2348 2349-2350 2351-2352 2353-2354 2355-2356 2357-2358 2359-2360 2361-2362 2363-2364 2365-2366 2367-2368 2369-2370 2371-2372 2373-2374 2375-2376 2377-2378 2379-2380 2381-2382 2383-2384 2385-2386 2387-2388 2389-2390 2391-2392 2393-2394 2395-2396 2397-2398 2399-2400 2401-2402 2403-2404 2405-2406 2407-2408 2409-2410 2411-2412 2413-2414 2415-2416 2417-2418 2419-2420 2421-2422 2423-2424 2425-2426 2427-2428 2429-2430 2431-2432 2433-2434 2435-2436 2437-2438 2439-2440 2441-2442 2443-2444 2445-2446 2447-2448 2449-2450 2451-2452 2453-2454 2455-2456 2457-2458 2459-2460 2461-2462 2463-2464 2465-2466 2467-2468 2469-2470 2471-2472 2473-2474 2475-2476 2477-2478 2479-2480 2481-2482 2483-2484 2485-2486 2487-2488 2489-2490 2491-2492 2493-2494 2495-2496 2497-2498 2499-2500 2501-2502 2503-2504 2505-2506 2507-2508 2509-2510 2511-2512 2513-2514 2515-2516 2517-2518 2519-2520 2521-2522 2523-2524 2525-2526 2527-2528 2529-2530 2531-2532 2533-2534 2535-2536 2537-2538 2539-2540 2541-2542 2543-2544 2545-2546 2547-2548 2549-2550 2551-2552 2553-</p>
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